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Mizuno

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(54) **IMAGE DISTRIBUTION APPARATUS AND IMAGE DISTRIBUTION METHOD**

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G06F 17/30 (2006.01)
H04N 1/32 (2006.01)

(52) **U.S. Cl.**
CPC ***G06F 17/30247*** (2013.01); ***H04N 1/00159*** (2013.01); ***H04N 1/00217*** (2013.01); ***H04N 1/32128*** (2013.01); *H04N 2201/328* (2013.01); *H04N 2201/3253* (2013.01); *H04N 2201/3278* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

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The above foreign patent documents were cited in the Jul. 14, 2014 Japanese Office Action, which is enclosed without an English Translation, that issued in Japanese Patent Application No. 2010-214336.

* cited by examiner

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(57) **ABSTRACT**

The present invention enables image distribution while maintaining privacy, using a simple configuration. An image distribution apparatus which distributes image data to which location information has been added stores information specifying an inhibited area concerning the location information and determines whether or not a location indicated by the location information added to the image data to be distributed falls within the stored inhibited area. If it is determined that the location indicated by the location information falls within the inhibited area, the image distribution apparatus distributes the image data by deleting the location information from the image data to be distributed. On the other hand, if it is determined that the location indicated by the location information falls outside the inhibited area, the image distribution apparatus distributes the image data with the location information added.

7 Claims, 14 Drawing Sheets

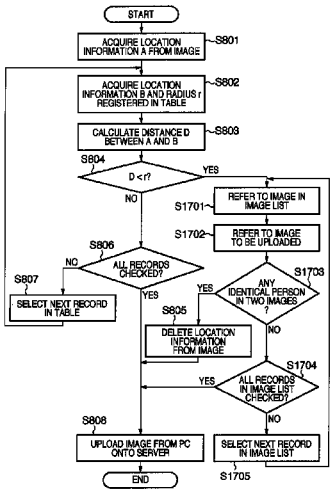

FIG. 1A

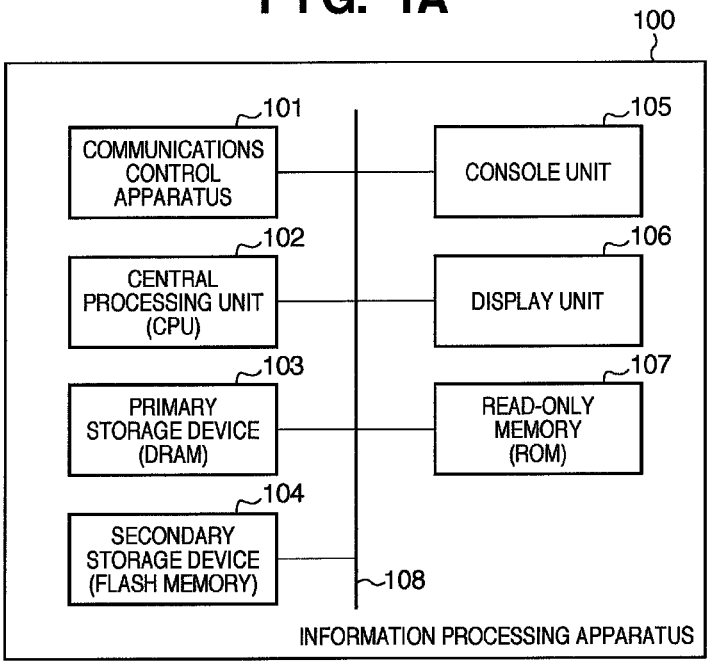
100
101
COMMUNICATIONS CONTROL APPARATUS
102
CENTRAL PROCESSING UNIT (CPU)
103
PRIMARY STORAGE DEVICE (DRAM)
104
SECONDARY STORAGE DEVICE (FLASH MEMORY)
105
CONSOLE UNIT
106
DISPLAY UNIT
107
READ-ONLY MEMORY (ROM)
108
INFORMATION PROCESSING APPARATUS

FIG. 1B

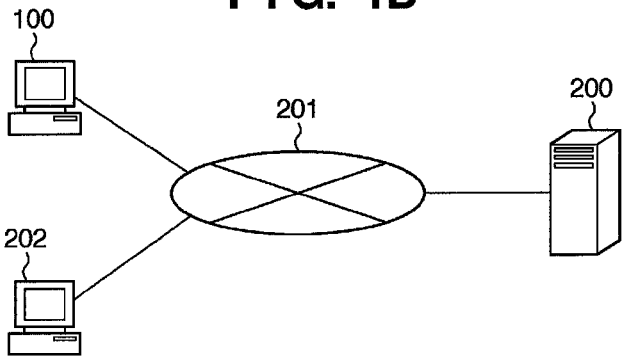
100
201
200
202

FIG. 2A

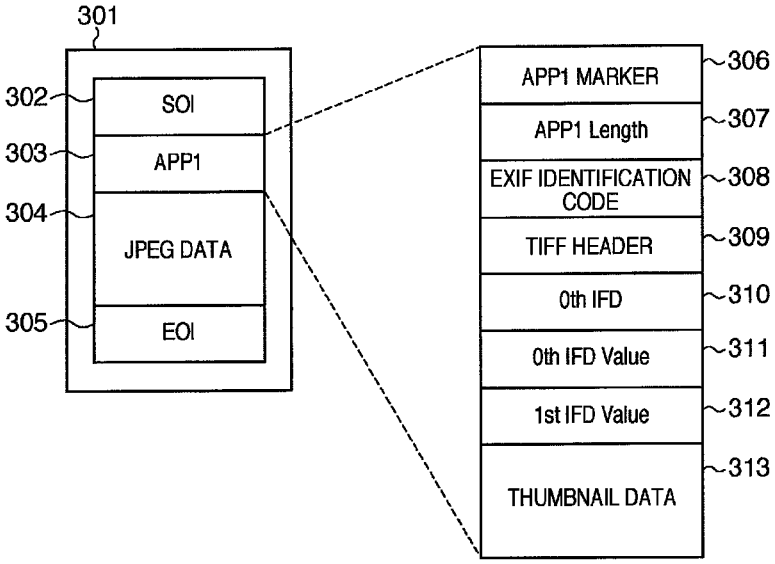
301
302
SOI
303
APP1
304
JPEG DATA
305
EOI
APP1 MARKER
306
APP1 Length
307
EXIF IDENTIFICATION CODE
308
TIFF HEADER
309
0th IFD
310
0th IFD Value
311
1st IFD Value
312
THUMBNAIL DATA
313

FIG. 2B

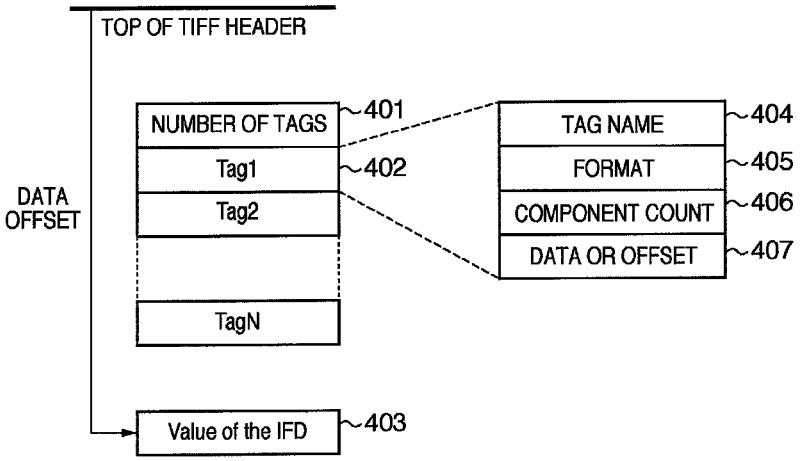
TOP OF TIFF HEADER
DATA OFFSET
NUMBER OF TAGS
401
Tag1
402
Tag2
TagN
Value of the IFD
403
TAG NAME
404
FORMAT
405
COMPONENT COUNT
406
DATA OR OFFSET
407

FIG. 3A

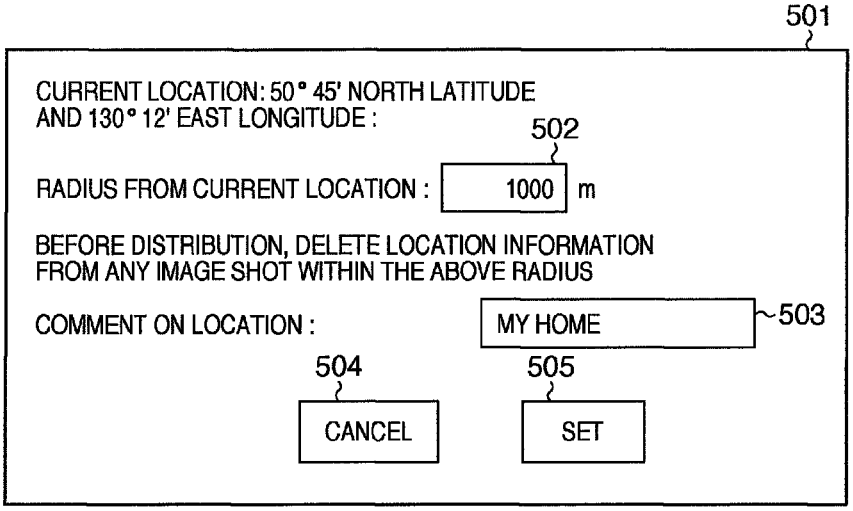

FIG. 3B

600

601 LATITUDE	602 LONGITUDE	603 RADIUS	604 COMMENT	
N50° 45'	E130° 12'	1000m	MY HOME	610
N50° 14'	E129° 35'	100m	CHUKYO LAND	611
N49° 45'	E132° 48'	300m	MARUNOUCHI	612
N48° 28'	E131° 39	125m		613
⋮				

FIG. 4

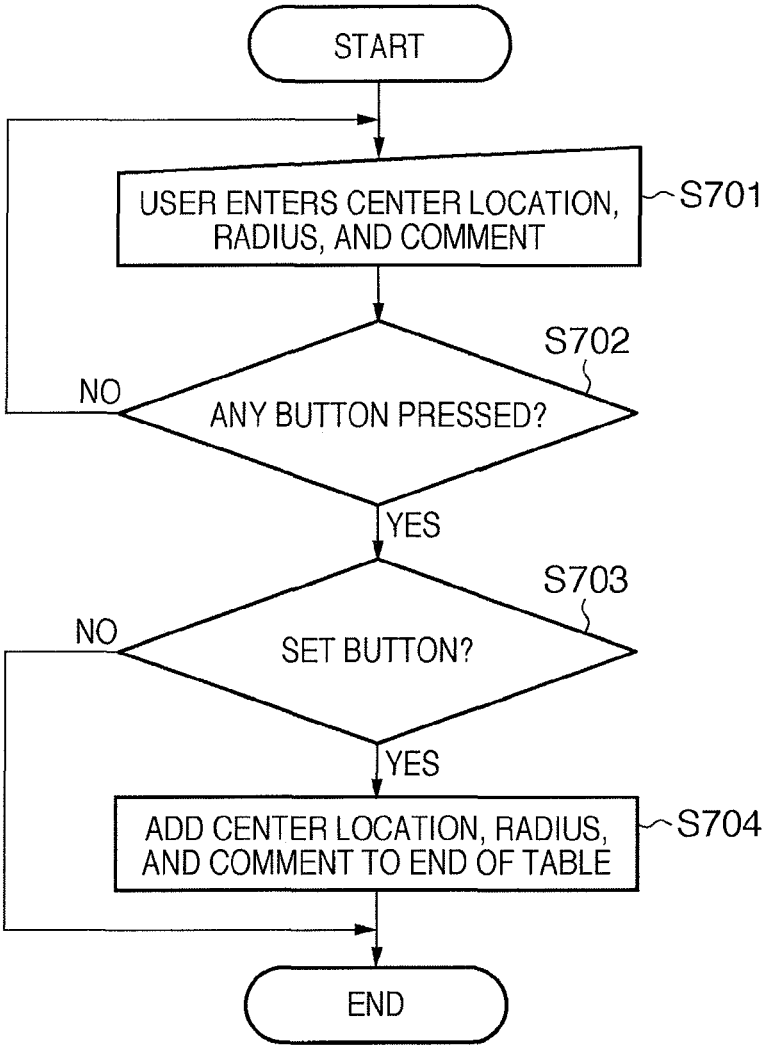
START
USER ENTERS CENTER LOCATION, RADIUS, AND COMMENT
S701
S702
ANY BUTTON PRESSED?
NO
YES
S703
SET BUTTON?
NO
YES
ADD CENTER LOCATION, RADIUS, AND COMMENT TO END OF TABLE
S704
END

FIG. 5

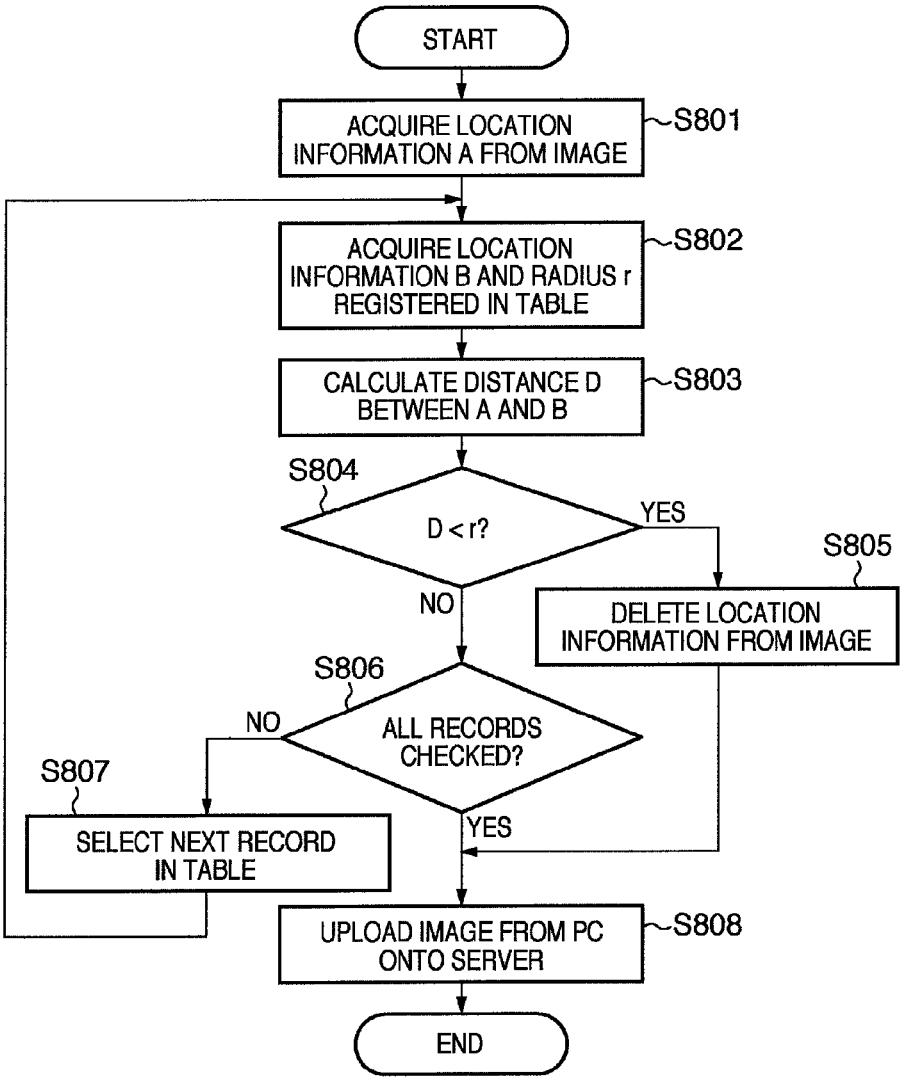
START
ACQUIRE LOCATION INFORMATION A FROM IMAGE
S801
ACQUIRE LOCATION INFORMATION B AND RADIUS r REGISTERED IN TABLE
S802
CALCULATE DISTANCE D BETWEEN A AND B
S803
S804
D < r?
YES
S805
DELETE LOCATION INFORMATION FROM IMAGE
NO
S806
ALL RECORDS CHECKED?
NO
S807
SELECT NEXT RECORD IN TABLE
YES
UPLOAD IMAGE FROM PC ONTO SERVER
S808
END

FIG. 6A

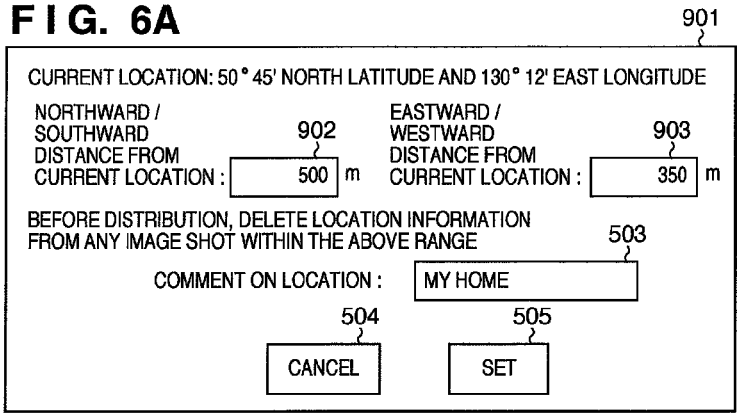

FIG. 6B

1000

1001 LATITUDE	1002 LONGITUDE	1003 EAST-WEST DIRECTION	1004 NORTH-SOUTH DIRECTION	1005 COMMENTS
N50° 45'	E130° 12'	1500m	1500m	MY HOME ~1010
N50° 14'	E129° 35'	150m	100m	CHUKYO LAND
N49° 45'	E132° 48'	400m	300m	MARUNOUCHI
N48° 28'	E131° 39'	75m	125m	
⋮				

FIG. 6C

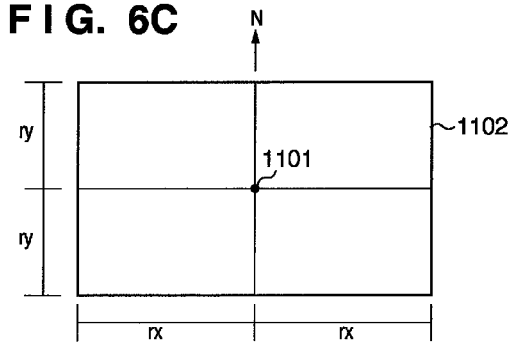

FIG. 7

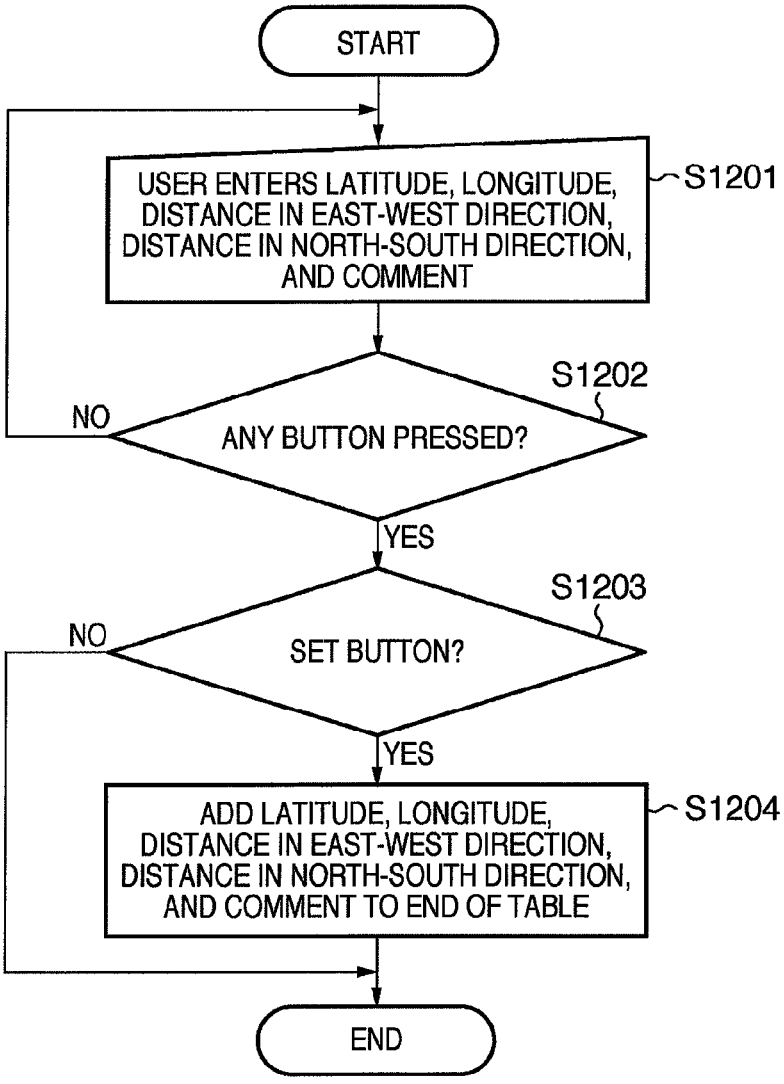
START
USER ENTERS LATITUDE, LONGITUDE, DISTANCE IN EAST-WEST DIRECTION, DISTANCE IN NORTH-SOUTH DIRECTION, AND COMMENT
S1201
S1202
ANY BUTTON PRESSED?
NO
YES
S1203
SET BUTTON?
NO
YES
ADD LATITUDE, LONGITUDE, DISTANCE IN EAST-WEST DIRECTION, DISTANCE IN NORTH-SOUTH DIRECTION, AND COMMENT TO END OF TABLE
S1204
END

FIG. 8

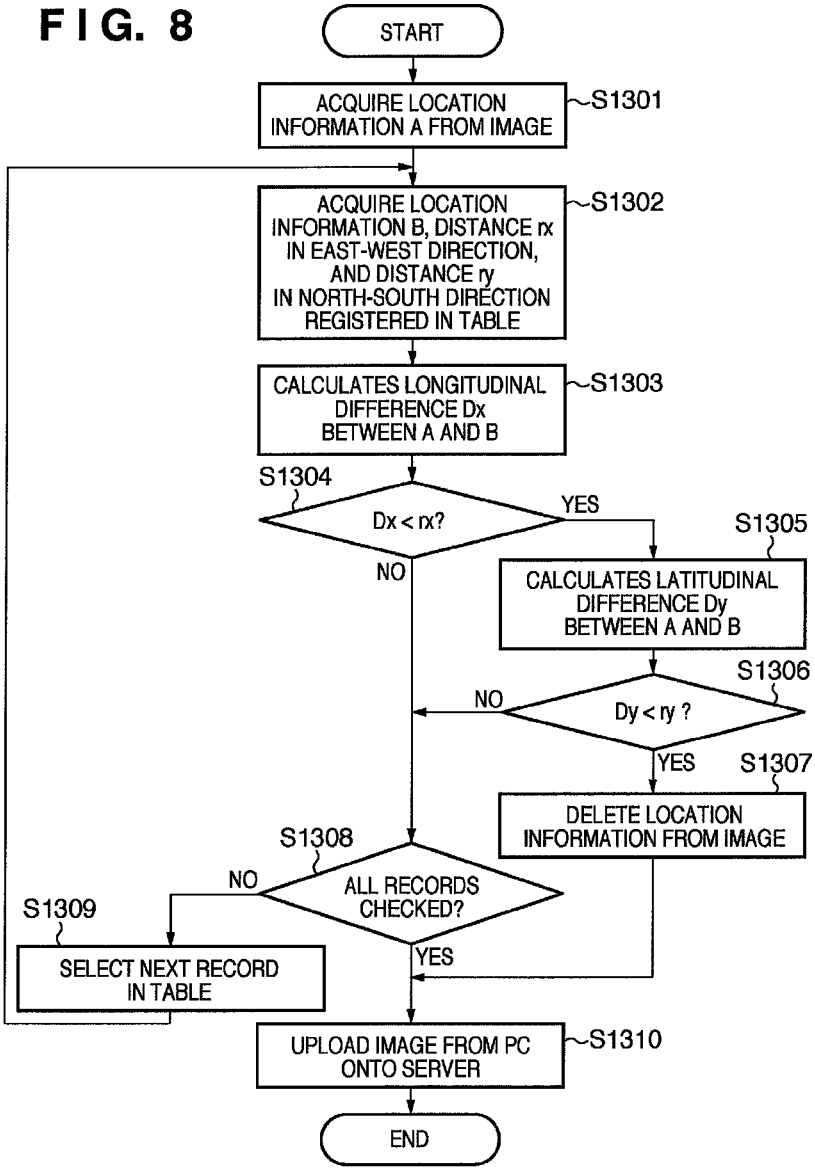
START
ACQUIRE LOCATION INFORMATION A FROM IMAGE
S1301
ACQUIRE LOCATION INFORMATION B, DISTANCE rx IN EAST-WEST DIRECTION, AND DISTANCE ry IN NORTH-SOUTH DIRECTION REGISTERED IN TABLE
S1302
CALCULATES LONGITUDINAL DIFFERENCE Dx BETWEEN A AND B
S1303
S1304
Dx < rx?
YES
NO
S1305
CALCULATES LATITUDINAL DIFFERENCE Dy BETWEEN A AND B
S1306
NO
Dy < ry ?
YES
S1307
DELETE LOCATION INFORMATION FROM IMAGE
S1308
NO
ALL RECORDS CHECKED?
S1309
SELECT NEXT RECORD IN TABLE
YES
UPLOAD IMAGE FROM PC ONTO SERVER
S1310
END

FIG. 9A

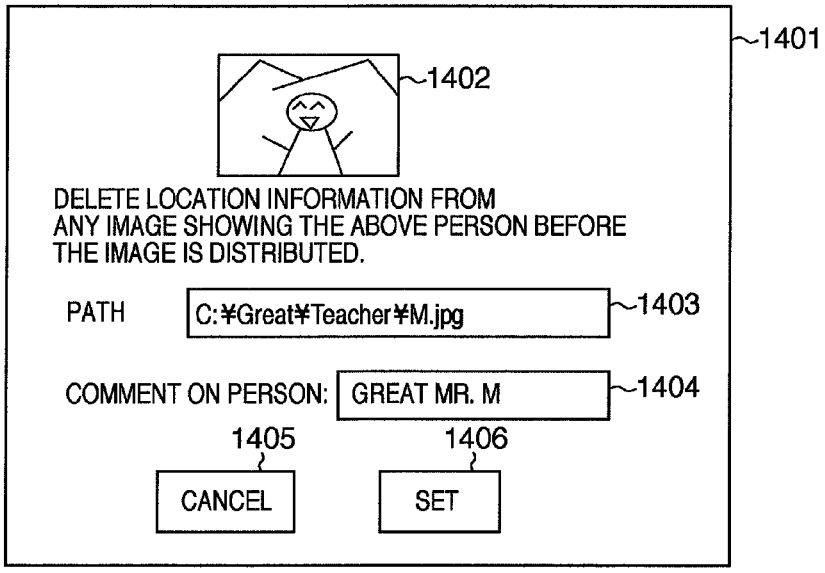

FIG. 9B

1500

1501 IMAGE PATH	1502 COMMENT
C:¥Great¥Teacher¥M.jpg	GREAT MR. M
C:¥MyPicture¥0001.jpg	MR. A
C:¥20090604¥ChukyoTower.jpg	ADMIRABLE MR. G
⋮	⋮

1510

FIG. 10

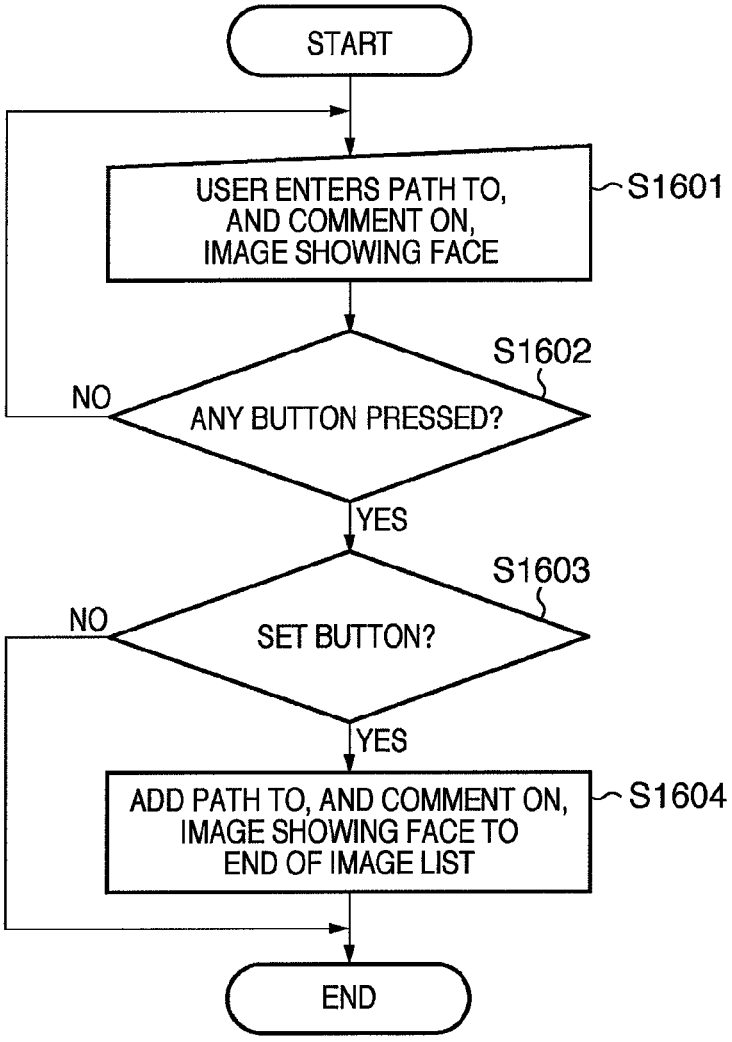
START
USER ENTERS PATH TO, AND COMMENT ON, IMAGE SHOWING FACE
S1601
S1602
ANY BUTTON PRESSED?
NO
YES
S1603
SET BUTTON?
NO
YES
ADD PATH TO, AND COMMENT ON, IMAGE SHOWING FACE TO END OF IMAGE LIST
S1604
END

FIG. 11

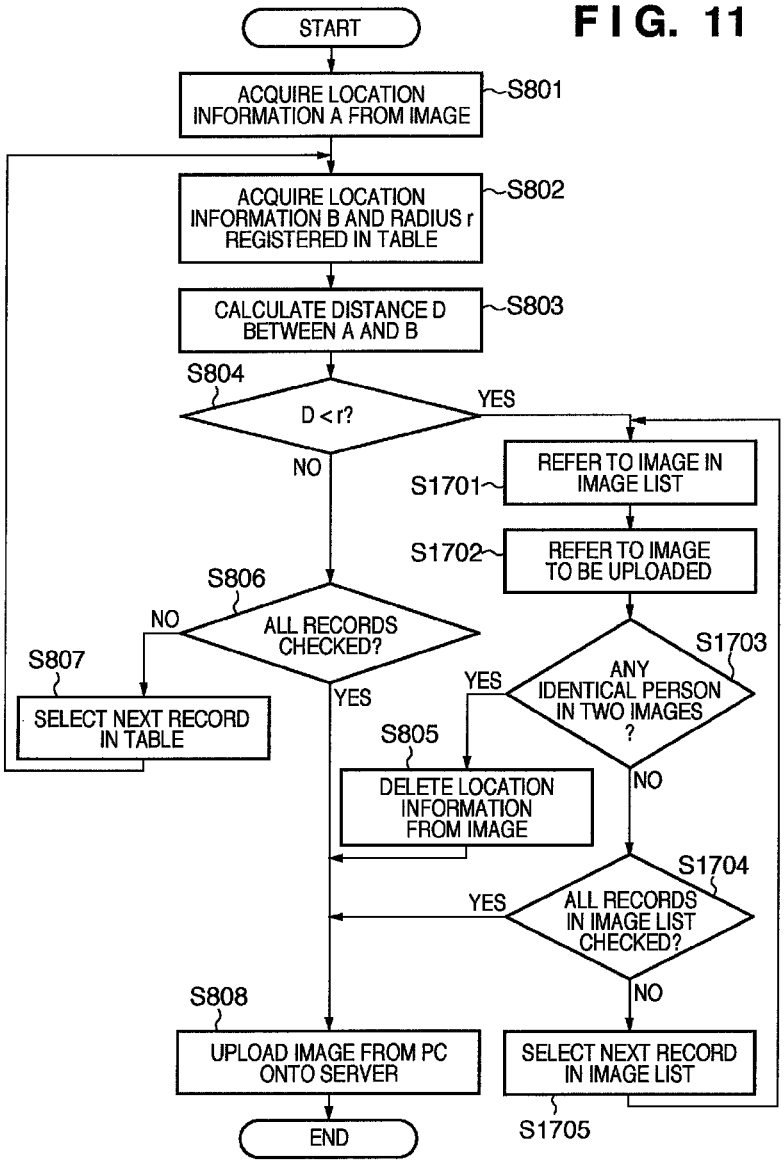
START
ACQUIRE LOCATION INFORMATION A FROM IMAGE
S801
ACQUIRE LOCATION INFORMATION B AND RADIUS r REGISTERED IN TABLE
S802
CALCULATE DISTANCE D BETWEEN A AND B
S803
S804
D < r?
YES
NO
REFER TO IMAGE IN IMAGE LIST
S1701
REFER TO IMAGE TO BE UPLOADED
S1702
S806
ALL RECORDS CHECKED?
NO
YES
S807
SELECT NEXT RECORD IN TABLE
S1703
ANY IDENTICAL PERSON IN TWO IMAGES ?
YES
NO
S805
DELETE LOCATION INFORMATION FROM IMAGE
S1704
ALL RECORDS IN IMAGE LIST CHECKED?
YES
NO
S808
UPLOAD IMAGE FROM PC ONTO SERVER
SELECT NEXT RECORD IN IMAGE LIST
S1705
END

FIG. 12A

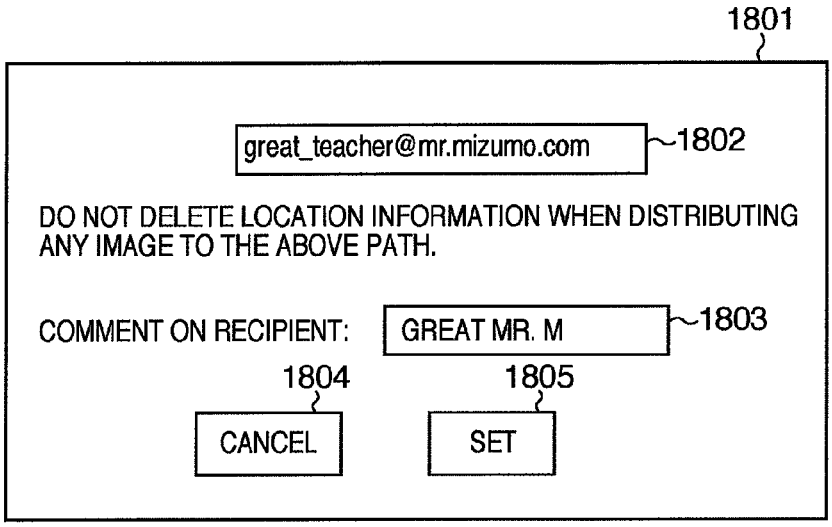

FIG. 12B

1900

1901 COMMENTS	1902 ADDRESS
GREAT MR. M	great_teacher@mr.mizumo.com
MR. B	b@camon.co.jp
TiG SERVER	http://www.tig.camon.co.jp

1910

FIG. 13

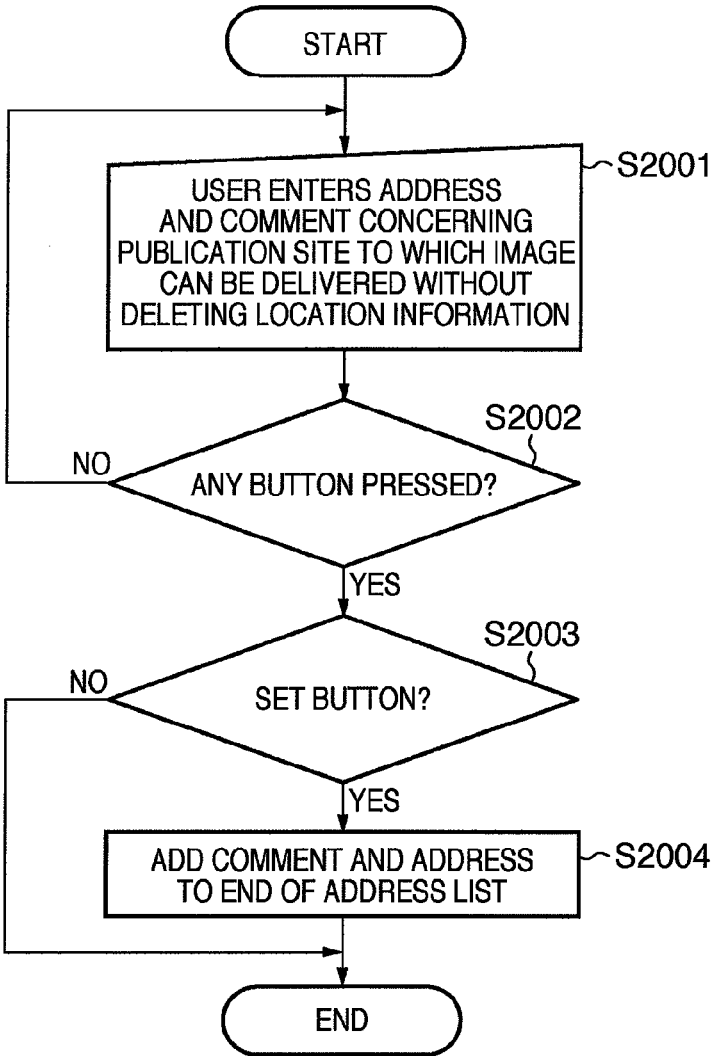
START
USER ENTERS ADDRESS AND COMMENT CONCERNING PUBLICATION SITE TO WHICH IMAGE CAN BE DELIVERED WITHOUT DELETING LOCATION INFORMATION
S2001
S2002
ANY BUTTON PRESSED?
NO
YES
S2003
SET BUTTON?
NO
YES
ADD COMMENT AND ADDRESS TO END OF ADDRESS LIST
S2004
END

FIG. 14

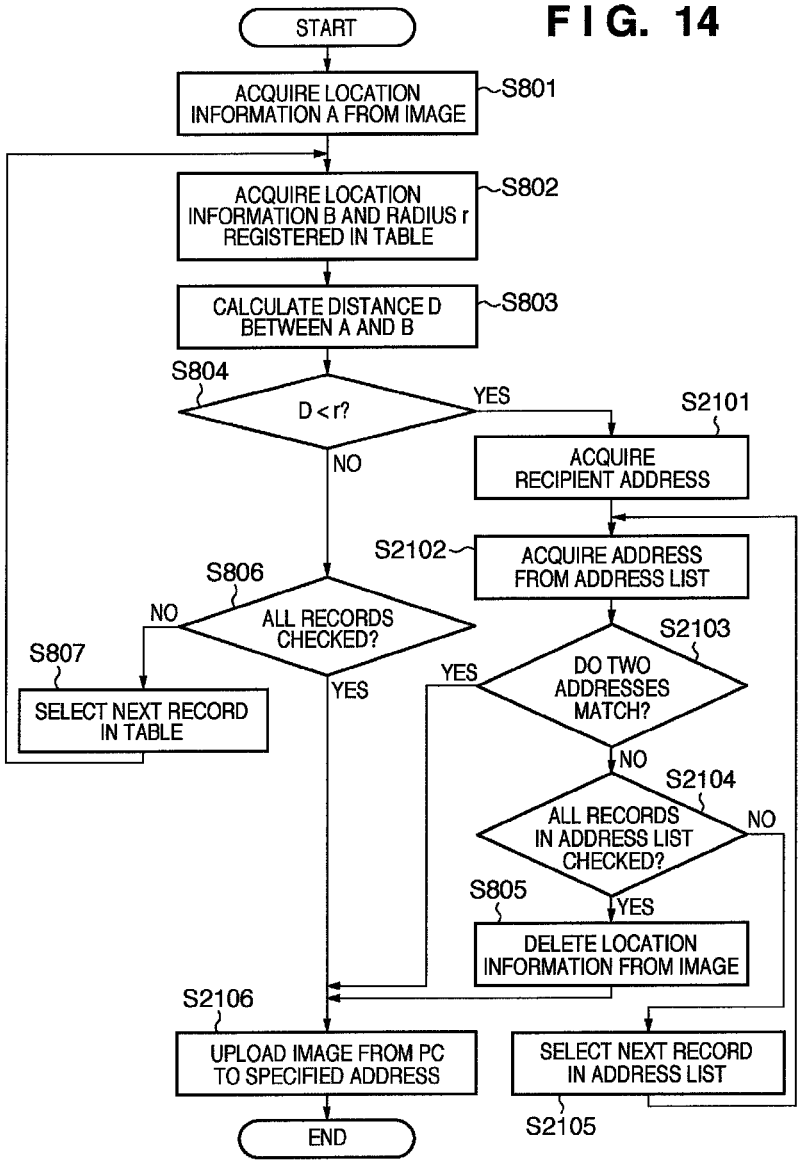
START
ACQUIRE LOCATION INFORMATION A FROM IMAGE
S801
ACQUIRE LOCATION INFORMATION B AND RADIUS r REGISTERED IN TABLE
S802
CALCULATE DISTANCE D BETWEEN A AND B
S803
S804
D < r?
YES
NO
S2101
ACQUIRE RECIPIENT ADDRESS
S2102
ACQUIRE ADDRESS FROM ADDRESS LIST
S806
ALL RECORDS CHECKED?
NO
YES
S807
SELECT NEXT RECORD IN TABLE
S2103
DO TWO ADDRESSES MATCH?
YES
NO
S2104
ALL RECORDS IN ADDRESS LIST CHECKED?
NO
YES
S805
DELETE LOCATION INFORMATION FROM IMAGE
S2106
UPLOAD IMAGE FROM PC TO SPECIFIED ADDRESS
SELECT NEXT RECORD IN ADDRESS LIST
S2105
END

IMAGE DISTRIBUTION APPARATUS AND IMAGE DISTRIBUTION METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of application Ser. No. 12/915,285, filed Oct. 29, 2010 the entire disclosure of which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an image distribution apparatus and image distribution method which distribute image data.

2. Description of the Related Art

Recently, digital cameras equipped with a GPS (Global Positioning System) function have appeared on the market. Such a digital camera allows location information to be added to shot images. Also, there is application software which displays the images to which location information has been added on a map. Besides, it has recently become possible to distribute images to many people by uploading the images onto a server. Consequently, it is pointed out that location information added to the images may cause infringement on the privacy of the photographer or photographed person.

Under these circumstances, Japanese Patent Laid-Open No. 2008-027336 (hereinafter referred to as Document 1) proposes to put restrictions on publication of images to protect privacy by managing image data and location information in different databases. On the other hand, Japanese Patent Laid-Open No. 2004-343627 (hereinafter referred to as Document 2) proposes to delete all additional information of images including location information before uploading the images onto a server.

However, the technique in Document 1 has a problem of increased costs because of the need to prepare two databases (database for image data and database for location information). Also, the technique in Document 2 deletes, from the images, not only the location information, but also additional information which the user wants to publish. That is, the conventional techniques cannot distribute images while protecting privacy, using a simple configuration.

SUMMARY OF THE INVENTION

The present invention has been made in view of the above problems and provides an image distribution apparatus and method, one preferred embodiment of which enables image distribution while maintaining privacy, using a simple configuration.

According to one aspect of the present invention, there is provided an image distribution apparatus which distributes image data to which location information has been added, comprising: a storage unit configured to store information specifying an inhibited area concerning the location information; an acquisition unit configured to acquire the location information added to the image data to be distributed; a location checking unit configured to determine whether or not a location indicated by the location information acquired by the acquisition unit falls within the inhibited area stored in the storage unit; and a distribution control unit configured to distribute the image data by deleting the location information from the image data to be distributed if the location checking unit determines that the location falls within the inhibited area and distribute the image data with the location information added if the location checking unit determines that the location falls outside the inhibited area.

Furthermore, according to another aspect of the present invention, there is provided an image distribution method for an image distribution apparatus which distributes image data to which location information has been added, the image distribution method comprising: an acquisition step in which an acquisition unit acquires the location information added to the image data to be distributed; a location checking step in which a location checking unit determines whether or not a location indicated by the location information acquired by the acquisition unit falls within an inhibited area concerning the location information, stored in a storage unit; and a distribution control step in which a distribution control unit distributes the image data by deleting the location information from the image data to be distributed if the location checking unit determines that the location falls within the inhibited area, and distributes the image data with the location information added if the location checking unit determines that the location falls outside the inhibited area.

Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A is a diagram showing a configuration example of an information processing apparatus;

FIG. **1**B is a diagram showing an example of an entire system;

FIG. **2**A is a diagram showing a structure of a jpg file;

FIG. **2**B is a diagram showing a structure of an IFD;

FIG. **3**A is a diagram showing an example of a user interface (UI) used to set an inhibited area concerning location information;

FIG. **3**B is a diagram showing an example of a table storing inhibited areas;

FIG. **4** is a diagram showing a registration process of a inhibited area according to a first embodiment;

FIG. **5** is a diagram showing an image distribution process according to the first embodiment;

FIG. **6**A is a diagram showing an example of a UI used to set an inhibited area concerning location information, according to a second embodiment;

FIG. **6**B is a diagram showing an example of a table storing inhibited areas;

FIG. **6**C is a diagram showing a range of a rectangular area;

FIG. **7** is a diagram showing a registration process of an inhibited area according to the second embodiment;

FIG. **8** is a diagram showing an image distribution process according to the second embodiment;

FIG. **9**A is a diagram showing an example of a UI used for registration of a facial image, according to a third embodiment;

FIG. **9**B is a diagram showing an example of an image list;

FIG. **10** is a diagram showing the process of registering an image in an image list, according to the third embodiment;

FIG. **11** is a diagram showing an image distribution process according to the third embodiment;

FIG. **12**A is a diagram showing an example of a UI used for address registration, according to a fourth embodiment;

FIG. **12**B is a diagram showing an example of an address list;

FIG. **13** is a diagram showing the process of registering an address in an address list, according to the fourth embodiment; and

FIG. **14** is a diagram showing an image distribution process according to the fourth embodiment.

DESCRIPTION OF THE EMBODIMENTS

Embodiments of the present invention will be described below in detail with reference to the accompanying drawings.

<First Embodiment>

FIG. **1**A is a diagram showing a configuration example of an information processing apparatus **100** used as an image distribution apparatus, according to an embodiment of the present invention. In the information processing apparatus **100**, a communications control apparatus **101**, which is a unit configured to communicate with external apparatuses, controls wired or wireless communications with the external apparatuses. A central processing unit (CPU) **102** controls the entire information processing apparatus **100** based on input signals and programs. A primary storage device (DRAM) **103** is used as a temporary storage area and the like for the CPU **102**. A secondary storage device **104** includes a non-volatile storage device such as a flash memory and stores various parameters and the like. A console unit **105** includes a keyboard, mouse, and the like and allows a user to give various commands to the information processing apparatus **100**. A display unit **106** is a member used to display image data and a graphical user interface (GUI). For example, a LCD or the like is used as the display unit **106**. A read-only memory (ROM) **107** stores a control program to be executed by the CPU **102**. A CPU bus **108** includes an address bus, data bus, and control bus.

A configuration example of an entire system according to the present embodiment is shown in FIG. **1**B. The information processing apparatus **100** is connected via a network **201** to a server **200**, which is an external apparatus, in such a way as to be able to communicate with the server **200**. The information processing apparatus **100** is also connected to another information processing apparatus **202** via the network **201** in such a way as to be able to communicate with the information processing apparatus **202** as well. According to the present embodiment, the connection to the network may be either a wired type or wireless type.

Next, a structure of image data used in the present embodiment will be described. According to the present embodiment, it is assumed that the image data is contained in a "JPEG file" in JPEG format and that additional information is in Exif format, but these are not restrictive. FIG. **2**A is a diagram showing a structure of the image data used in the present embodiment, that is, the structure of a "JPEG file."

As shown in FIG. **2**A, in a JPEG file **301**, section **302** (SOI) stores data which indicates the top of a "JPEG file." Section **303** (APP1) is called an application marker segment and stores Exif additional information described later. Hereinafter section **303** will be referred to as the application marker segment **303**. Section **304** (JPEG data) is intended to store JPEG-compressed image data and stores parameters needed for compression as well as stores compressed image data. Section **305** (EOI) stores data which indicates the end of the JPEG file **301**.

Section **306** (APP1 marker) stores data which indicates the top of the application marker segment **303**. In the present example, the character string "FFE1" is recorded in section **306**. Section **307** (APP1 Length) stores size of the application marker segment **303**. Section **308** stores a code (Exif identification code) used to identify Exif additional information. Section **309** records a TIFF header, that is, an offset which indicates head position of IFD data in an IFD (Image File Directory) structure described later with reference to FIG. **2**B. Section **310** (0th IFD) has a structure known as IFD and stores attribute information of image data. Example of the attribute information includes information regarding data structure of an image, recording position of the image (location information), characteristics of image data, and an image sensing device. Section **311** (0th IFD Value) stores a concrete value of part of the attribute information in section **310**. Section **312** (1st IFD Value) records attribute information of thumbnails. Section **313** stores thumbnail data.

FIG. **2**B is a diagram showing a structure of an IFD. Field **401** records the number of tags, where the tag is a unit for describing parameters of attribute information. IFD data contains as many tags are there are parameters. When the number of tags is 10 (N=10), "10" is recorded in field **401**. Field **402** (tag) stores a tag which has field **404** (tag name), field **405** (format), field **406** (component count), and field **407** (data or offset).

Field **404** stores a tag name (a number which represents an item of attribute information, according to the present embodiment). Field **405** stores format information which represents data type of attribute information. Examples of the data type of the attribute information include 1-byte data, 2-byte data, character string, and fraction. Field **406** stores component count which represents how many data items of the type specified in field **405** (format) are contained in one tag. For example, if the attribute information is given as character string data of 20 characters, "character string" is recorded in field **405** (format) and "20" is recorded in field **406** (component count). Also, for example, if the attribute information contains two items of 2-byte data, "2-byte data" is recorded in field **405** (format) and "2" is recorded in field **406** (component count).

Field **407** (data or offset) stores the attribute information itself or data which represents an offset from the top of the TIFF header recorded in section **309**. Field **407** has a 4-byte fixed length. Consequently, if the attribute information is too large to be stored in 4 bytes, the attribute information is recorded at an address (field **403**) indicated by the offset from the top of the TIFF header in section **309**. In this case, value of the offset from the TIFF header in section **309** is recorded in field **407** (data or offset).

An example of how location information is recorded in an image file will be described below. According to the present embodiment, location information to be recorded is given in terms of longitude and latitude (e.g., 50° 13' north latitude and 140° 48' east longitude) and recorded in IFD (GPS IFD) format in the image file. The location information is recorded in field **402**. In this case, a tag which indicates location information is recorded in field **404** (tag name) of field **402** (tag). In this example, a numerical value of 0×8825 is recorded. The data format (GPS IFD, in this example) of the location information is recorded in field **405** (format). Since the Exif standard prescribes that the data type of GPS IFD location information is 4-byte data, a numerical value of "4" is entered in field **406** (component count). The offset from the top of the TIFF header in section **309** is recorded in field **407** (data or offset). That is, the location information is recorded in GPS IFD format at an address separated from the top of the TIFF header stored in section **309** by a distance equal to a byte count recorded in field **407** (data or offset).

The GPS IFD also has the structure shown in FIG. **2**B. The number of tags needed for location information is recorded in field **401** (number of tags). In this example, five tags are recorded: GPS tag version, information indicating north latitude or south latitude, latitude, information indicating east longitude or west longitude, and longitude. Consequently, "5" which is the number of tags is recorded in field **401**

(number of tags). The GPS tag version is recorded in field **402** (tag). In so doing, information corresponding to the "GPS tag version" is recorded in field **404** (tag name), field **405** (format), field **406** (component count), and field **407** (data or offset), respectively. Similarly, "information indicating north latitude or south latitude," "latitude tag," "information indicating east longitude or west longitude," and lastly "longitude tag" are recorded in subsequent tag fields. The latitude and longitude are recorded in the form of a 4-byte/4-byte fraction. For example, "50° 13'" is recorded as "3013" and "60" while "140° 48'" is recorded as "8448" and "60."

Incidentally, the image data used in the present embodiment is not limited to JPEG files in Exif format as long as additional information such as location information can be added to the image data.

FIG. **3**A shows a setting screen used by the user to enter inputs and thereby specify a deletion range to the information processing apparatus **100** when deleting location information from image data. As the CPU **102** executes a predetermined program, a setting screen such as shown in FIG. **3**A is brought up in the display unit **106**. The setting screen allows the user to set an inhibited area by entering latitude and longitude which represent a location on the ground and a radius which represents a range. According to the present embodiment, if location information added to image data indicates a location within a specified inhibited area, the image data is distributed with the location information deleted. The setting screen **501** displays the location acquired from the location information of an image, in terms of longitude and latitude. By watching the setting screen **501**, the user enters a radius in a box **502**, and a comment on the location in a box **503**. Incidentally, it is not always necessary to enter a comment. When the user presses a setting button **505**, the range of location information to be deleted from the image is stored in tabular form shown in FIG. **3**B, in the secondary storage device **104** of the information processing apparatus **100**. By pressing a cancel button **504**, the user can exit the setting screen **501** without doing anything. According to the entered data in FIG. **3**A, an inhibited area is located within a 1000-m radius around the point at 50° 45' north latitude and 130° 12' east longitude. Alternatively, an area to be excluded from the inhibited area may be specified. The current location may be acquired from a GPS sensor. Alternatively, the user may be allowed to specify a desired location on a displayed digital map and the longitude and latitude of the specified location may be used as the current location.

FIG. **3**B is a diagram showing a table **600** storing the range of location information to be deleted from an image stored in the information processing apparatus **100**, when the image is distributed. The table **600** stores latitude **601**, longitude **602**, a radius **603** entered in the box **502**, and a comment **604** entered in the box **503**. When the Set button **505** is pressed under the conditions displayed on the screen in FIG. **3**A, contents of record **610** is registered. The comment **604** describes the location defined by the latitude **601** and longitude **602** and contains a location name, facility name, place name, or the like. However, the comment **604** may be left empty. A range indicated by each record of the table **600**, that is, a range of a circle with a radius indicated by the radius **603** centered at a geographical location defined by the latitude **601** and longitude **602**, corresponds to an inhibited area. In the example of FIG. **3**B, it can be seen that four inhibited areas (records **611** to **613**) are registered.

A process flow for registering an inhibited area in the table **600** will be described below with reference to FIG. **4**.

In step **5701**, the CPU **102** accepts inputs of latitude, longitude, radius, and comment from the user. As described above, to enter the latitude and longitude, a GPS signal is used or the user is allowed to specify a desired location on a displayed map. On the other hand, the radius and comment are entered by the user via the boxes **502** and **503**, respectively. Next, in step S**702**, the CPU **102** determines whether or not any button has been pressed. If it is determined in step **5702** that a button has been pressed, the CPU **102** goes to step S**703**. If it is determined in step S**702** that no button has been pressed, the CPU **102** repeats steps S**701** and S**702** until a button is pressed. In step S**703**, the CPU **102** determines whether the pressed button is the Set button **505**. If it is determined in step S**703** that the pressed button is the Set button **505**, the CPU **102** goes to step S**704** to add a new record containing the latitude, longitude, radius, and comment entered in step S**701** to the end of the table **600**. It is assumed that the table **600** is recorded in the secondary storage device **104**. On the other hand, if it is determined in step S**703** that the Cancel button **504** has been pressed, the CPU **102** finishes the process right away.

FIG. **5** is a diagram showing image distribution control according to the present embodiment. According to the present embodiment, it is determined before distribution of an image whether location information has to be deleted from the image. If it is determined that the location information has to be deleted, the image is distributed with the location information deleted.

In step S**801**, the CPU **102** acquires the location information added to the image to be distributed. In step S**802**, the CPU **102** acquires a record containing an inhibited area from the table **600**. In steps S**803** and S**804**, the CPU **102** carries out location checking to determine whether the location indicated by the location information acquired from the image to be distributed falls within the inhibited area stored in the table **600**. In step S**803**, the CPU **102** calculates a distance D between the location indicated by the location information acquired in step S**801** and the location (center location) of the inhibited area acquired in step S**802**. A method for determining distance between two points whose latitude and longitude are known will be described below:

For example, if a location (point A) prerecorded in the table is 50° 45' north latitude and 130° 12' east longitude and the current location (point B) is 50° 34' north latitude and 129° 58' east longitude and if a difference in a latitudinal direction is Δny and a difference in a longitudinal direction is Δnx,

$$\Delta ny = 11' \rightarrow 0.183°$$

$$\Delta nx = 14' \rightarrow 0.233°$$

It is assumed here that the earth is perfectly spherical and that the radius of the earth is R (=6378 km). If distance difference in the latitudinal direction is Δy and distance difference in the longitudinal direction is Δx, then Δy and Δx are given by the equations below.

$$\Delta y = 0.183°/360° \times 2\pi R = 20.37 \text{ km}$$

$$\Delta x = 0.233°/360° \times 2\pi R = 25.94 \text{ km}$$

Thus, the distance D between two points A and B is given by the equation below.

$$D = \sqrt{(\Delta x^2 + \Delta y^2)} = 32.98 \text{ km}$$

In step S**804**, the CPU **102** makes a comparison to determine whether the distance D determined in step S**803** is smaller than a radius r of the inhibited area registered in the table **600**. If it is determined in step S**804** that the distance D is smaller than the radius r registered in the table **600**, the location indicated by the location information of the image to be distributed falls within the inhibited area. When a location

falls within this range, the location information about the location must not be added to the image to be distributed. Thus, in step **S805**, the CPU **102** deletes the location information from the image. Then, the CPU **102** goes to step **S808** to upload the image onto the server (or deliver the image to an appropriate recipient).

If it is determined in step **S804** that the distance D is larger than the radius r of the inhibited area, the CPU **102** goes to step **S806**. In step **S806**, the CPU **102** determines whether all the records registered in the table **600** in FIG. **3**B have been checked. If it is determined in step **S806** that all the records have been checked, the CPU **102** goes to step **S808**. If it is determined in step **S806** that all the records in the table **600** have not been checked, the CPU **102** goes to step **S807** to select a next record in the table **600**. Then, the CPU **102** returns to step **S802**.

As described above, the first embodiment can protect the privacy of the photographer or photographed persons in an image containing location information concerning a specified inhibited area even if the user does not go to the trouble of making privacy protection settings before distribution.

<Second Embodiment>

Although in the first embodiment, the inhibited area is specified as the range of a circle defined by a center location and radius, the method for specifying the range is not limited to the use of a circle. As an example of another range specification method, a method described in the second embodiment specifies a range using a rectangle defined by a center location, distance from the center location in an east-west direction, and distance from the center location in a north-south direction.

A setting screen used to set an inhibited area according to the second embodiment is shown in FIG. **6**A. The setting screen is displayed in the display unit **106** of the information processing apparatus **100**. On the setting screen **901**, the user enters the distance rx(m) in the east-west direction in a box **903**, and the distance ry(m) in the north-south direction in a box **902**. Otherwise, the second embodiment is the same as the first embodiment (FIG. **3**A). When the user presses the Set button **505**, the settings on the setting screen **901** is registered as an inhibited area in record **1010** of a table **1000** such as shown in FIG. **6**B. The table **1000** is stored in the secondary storage device **104** of the information processing apparatus **100**. Record **1010** contains latitude **1001** and longitude **1002** which represent a geographical location as well as the east-west direction **1003** and north-south direction **1004** which represent size of a range centered around the geographical location.

According to the second embodiment, the inhibited area is set as shown in FIG. **6**C. In FIG. **6**C, the upward direction corresponds to the north. A range specified as the inhibited area corresponds to a rectangular area **1102** stretching rx eastward, rx westward, ry southward, and ry northward from a center location **1101**. Incidentally, rx is registered as the east-west direction **1003** and ry is registered as the north-south direction **1004**.

A registration process of an inhibited area according to the second embodiment will be described below with reference to FIG. **7**. In step **S1201**, the CPU **102** presents the setting screen **901** and accepts inputs of latitude, longitude, distance in the east-west direction, distance in the north-south direction, and comment from the user. In step **S1202**, the CPU **102** determines whether or not any button has been pressed. If it is determined in step **S1202** that a button has been pressed, the CPU **102** goes to step **S1203**. If it is determined in step **S1202** that no button has been pressed, the CPU **102** repeats steps **S1201** and **S1202** until a button is pressed.

In step **S1203**, the CPU **102** determines whether or not the pressed button is the Set button **505**. If it is determined in step **S1203** that the pressed button is the Set button **505**, the CPU **102** goes to step **S1204**. In step **S1204**, the CPU **102** adds record **1010** containing the latitude, longitude, distance in the east-west direction, distance in the north-south direction, and comment specified on the setting screen **901** to the end of the table **1000**. The table **1000** is stored in the secondary storage device **104**. On the other hand, if it is determined in step **S1203** that the Cancel button **504** has been pressed, the CPU **102** finishes the process without doing anything.

Now, image distribution control according to the second embodiment will be described below with reference to FIG. **8**. In step **S1301**, the CPU **102** acquires the location information added to the image to be distributed. In steps **S1302** to **S1306**, the CPU **102** determines whether the location indicated by the location information acquired from the image to be distributed falls within the inhibited area stored in the table **1000**. In step **S1302**, the CPU **102** acquires information about the center location (latitude **1001** and longitude **1002**), the distance rx in the east-west direction **1003**, and the distance ry in the north-south direction **1004** from the record registered in the table **1000**. In step **S1303**, the CPU **102** calculates a longitudinal difference Dx between the location indicated by the location information acquired in step **S1301** and the center location acquired in step **S1302**. In step **S1304**, the CPU **102** makes a comparison to determine whether the longitudinal difference Dx determined in step **S1303** is smaller than the distance rx in the east-west direction acquired in step **S1302**.

If it is determined in step **S1304** that the longitudinal difference Dx is smaller than the distance rx in the east-west direction, the CPU **102** goes to step **S1305**. In step **S1305**, the CPU **102** calculates a latitudinal difference Dy between the location indicated by the location information acquired in step **S1301** and the center location acquired in step **S1302**. In step **S1306**, the CPU **102** makes a comparison to determine whether the latitudinal difference Dy determined in step **S1305** is smaller than the distance ry in the north-south direction acquired in step **S1302**. If it is determined in step **S1306** that the latitudinal difference Dy is smaller than the distance ry in the north-south direction, it follows that the location indicated by the location information added to the image to be distributed falls within the inhibited area such as shown in FIG. **6**C. Thus, the CPU **102** deletes the location information from the image in step **S1307**, and then goes to step **S1310**. In step **S1310**, the CPU **102** uploads the image (or delivers the image to an appropriate recipient).

If it is determined in step **S1304** that "the longitudinal difference Dx ≥ the distance rx in the east-west direction" or if it is determined in step **S1306** that "the latitudinal difference Dy ≥ the distance ry in the north-south direction," the CPU **102** goes to step **S1308**. In step **S1308**, the CPU **102** determines whether all the records in the table **1000** have been checked. If it is determined in step **S1308** that all the records have been checked, the CPU **102** goes to step **S1310**. If it is determined in step **S1308** that all the records in the table **1000** have not been checked, the CPU **102** goes to step **S1309** to select a next record in the table **1000**. Then, the CPU **102** returns to step **S1302**.

As described above, the second embodiment can protect the privacy of the photographer or photographed persons in an image shot in a specified rectangular area even if the user does not go to the trouble of making privacy protection settings before distribution, as in the case of the first embodiment.

<Third Embodiment>

According to the first and second embodiments, when the location indicated by the location information added to the

image to be distributed falls within an inhibited area, the image is distributed with the location information deleted. According to the third embodiment, even when the location indicated by the location information in the image falls within an inhibited area, the location information is not deleted if a predetermined condition is satisfied. As an example of the predetermined condition, according to the third embodiment, the location information is not deleted if the image does not contain a preregistered pattern (the location information is deleted only when the image contains the preregistered pattern). In the following description, a human face is registered as an example of the pattern.

It is assumed that a facial recognition program is stored in the read-only memory **107** of the information processing apparatus **100**, allowing the CPU **102** to identify faces in the image on an individual basis. A setting screen used by the user to enter inputs for image registration in the third embodiment is shown in FIG. **9**A. The setting screen **1401** is displayed in the display unit **106** of the information processing apparatus **100**. The user registers faces by watching the setting screen **1401** (registration of facial images). For example, when a path to an image showing a face is entered in a box **1403** on the setting screen **1401**, an appropriate image appears in an image display area **1402**. Any comment (text) can be entered in a box **1404**. When the user presses a Set button **1406**, record **1510** is additionally registered in an image list **1500** as shown in FIG. **9**B. The image list **1500** is stored in the secondary storage device **104** of the information processing apparatus **100**. Each record of the image list **1500** includes an image path **1501** field containing an entry of the box **1403** and a comment **1502** field containing an entry of the box **1404**. The comment **1502** field may be omitted.

Procedures for registering an image in the image list **1500** will be described below with reference to FIG. **10**. In step **S1601**, the CPU **102** displays the setting screen **1401** in the display unit **106**. The user can enter a path to, and a comment on, an image showing a face in the boxes **1403** and **1404** of the setting screen **1401**, respectively. In step **S1602**, the CPU **102** determines whether any button on the setting screen **1401** has been pressed. If it is determined in step **S1602** that a button has been pressed, the CPU **102** goes to step **S1603**. If it is determined in step **S1602** that no button has been pressed, the CPU **102** repeats steps **S1601** and **S1602** until a button is pressed. In step **S1603**, the CPU **102** determines whether or not the pressed button is the Set button **1406**. If it is determined in step **S1603** that the pressed button is the Set button **1406**, the CPU **102** goes to step **S1604**. In step **S1604**, the CPU **102** adds a new record **1510** containing the "image path" and "comment" specified in the setting screen **1401** to the end of the image list **1500**. It is assumed that the image list **1500** is recorded in the secondary storage device **104**. On the other hand, if it is determined in step **S1603** that the Cancel button **1405** has been pressed, the CPU **102** finishes the process.

Now, image distribution control according to the third embodiment will be described below with reference to FIG. **11**. With an image distribution process according to the third embodiment, when the location indicated by the location information added to the image to be distributed falls within an inhibited area, the image is distributed with the location information deleted if the image contains a face contained in an image registered in an image list.

Steps **S801** to **S808** are the same as those described in the first embodiment (FIG. **5**). If it is determined in step **S804** that the distance D is smaller than the radius r, the CPU **102** goes to step **S1701**. In steps **S1701** to **S1703**, the CPU **102** carries out pattern checking to determine whether or not a face contained in the image to be distributed matches a face contained in any of registered images. In step **S1701**, the CPU **102** refers to an image registered in the image list **1500**. Specifically, the CPU **102** acquires one record from the image list **1500** and then acquires the image to refer to based on the path described in the image path **1501** field of the acquired record. In step **S1702**, the CPU **102** acquires the image to be uploaded (i.e., the image to be distributed). Then, in step **S1703**, the CPU **102** determines whether the two images acquired in steps **S1701** and **S1702** show an identical person. To determine whether two images show an identical person, a known technique (e.g., Japanese Patent Laid-Open No. 09-251534) may be used.

If it is determined in step **S1703** that the two images show an identical person, the CPU **102** deletes the location information from the image in step **S805**. Then, the CPU **102** goes to step **S808**. If it is determined in step **S1703** that the two images do not show any identical person, the CPU **102** determines in step **S1704** whether all the records in the image list **1500** have been checked. If it is determined in step **S1704** that all the records in the image list **1500** have been checked, the CPU **102** goes to step **S808**. If it is determined in step **S1704** that all the records in the image list **1500** have not been checked, the CPU **102** goes to step **S1705** to select a next record in the image list **1500**. Then, the CPU **102** returns to step **S1701**.

Thus, even if location information added to an image indicates a location within a specified inhibited area, the image can be distributed without deleting the location information if a registered person (face) is not shown in the image.

Although the third embodiment uses the inhibited area according to the first embodiment, needless to say, the inhibited area described in the second embodiment may be used alternatively.

With the configuration described above, even if location information added to an image indicates a location within a specified inhibited area, the location information is not deleted if the image does not show a registered face, but the presence or absence of a registered face may be handled in an opposite manner. Specifically, in a conceivable configuration, even if location information added to an image indicates a location within a specified inhibited area, the image can be distributed without deleting the location information if a registered person (face) is shown in the image. Also, when an image registered by image registration contains multiple faces, various methods are conceivable, including, for example:

(1) To delete the location information from the image to be distributed if a face detected in the image matches any one of the multiple faces, and

(2) To delete the location information from the image to be distributed if faces detected in the image match all the multiple faces.

<Fourth Embodiment>

According to the third embodiment, even when the location indicated by the location information in the image falls within an inhibited area, the location information is not deleted if a predetermined condition is satisfied. An example of the predetermined condition has been that the image does not contain a preregistered pattern. According to the fourth embodiment, the predetermined condition is whether or not the recipient (publication site) has been preregistered. According to the fourth embodiment, even when the location indicated by the location information in the image falls within an inhibited area, the location information is not deleted if the recipient has been preregistered. Thus, if familiar persons are registered as recipients in advance, images can be distributed to the familiar persons with the location information added.

An example of a setting screen according to the fourth embodiment is shown in FIG. **12**A. The setting screen **1801** is displayed in the display unit **106** of the information processing apparatus **100**. By watching the setting screen **1801**, the user registers an address to which images are to be distributed without deleting location information (recipient registration). The user enters a desired recipient address in a box **1802** and enters a comment on the address in a box **1803**. When the user presses a Set button **1805**, record **1910** is additionally registered in an address list **1900** as shown in FIG. **12**B. Each record of the address list **1900** includes a comment **1901** field containing an entry of the box **1803** and an address **1902** field containing an entry of the box **1802**. It is assumed that the address list **1900** is stored in the secondary storage device **104**. However, the comment **1901** field is not essential.

A registration process of the address list **1900** will be described below with reference to FIG. **13**. In step S**2001**, the CPU **102** displays the setting screen **1801** in the display unit **106**, allowing the user to enter an address and comment. In step S**2002**, the CPU **102** determines whether or not any button has been pressed. If it is determined in step S**2002** that a button has been pressed, the CPU **102** goes to step S**2003**. If it is determined in step S**2002** that no button has been pressed, the CPU **102** repeats step S**2002** until a button is pressed. In step S**2003**, the CPU **102** determines whether or not the pressed button is the Set button **1805**. If it is determined in step S**2003** that the pressed button is the Set button **1805**, the CPU **102** goes to step S**2004** to add a record containing the address and comment entered in the setting screen **1801** to the end of the address list **1900** and thereby registers the record. On the other hand, if it is determined in step S**2003** that the Cancel button **1804** has been pressed, the CPU **102** finishes the process right away.

Now, image distribution control according to the fourth embodiment will be described below with reference to FIG. **14**. Steps S**801** to S**807** are the same as those described in the first embodiment (FIG. **5**).

If it is determined in step S**804** that the distance D is smaller than the radius r, the CPU **102** goes to step S**2101**. In steps S**2101** to S**2105**, the CPU **102** performs address checking to determine whether or not a recipient address specified for distribution matches any of registered recipient addresses. In step S**2101**, the CPU **102** acquires a recipient address for the image to be distributed. In step S**2102**, the CPU **102** acquires the address from one of the records registered in the address list **1900**. In step S**2103**, the CPU **102** determines whether the two addresses acquired in steps S**2101** and S**2102** match. If it is determined in step S**2103** that the two addresses match, the CPU **102** goes to step S**2106** to distribute the image to the specified address. On the other hand, if it is determined in step S**2103** that the two addresses do not match, the CPU **102** determines in step S**2104** whether all the records in the address list **1900** have been checked. If it is determined in step S**2104** that all the records in the address list **1900** have been checked, the CPU **102** goes to step S**805** to delete the location information from the image. Then, the CPU **102** goes to step S**2106**. If it is determined in step S**2104** that all the records in the address list **1900** have not been checked, the CPU **102** goes to step S**2105** to select a next record in the address list **1900**. Then, the CPU **102** returns to step S**2102**.

As described above, according to the fourth embodiment, even when the location indicated by added location information falls within an inhibited area, the image can be distributed with the location information added if the image is distributed to a preregistered recipient.

Although the fourth embodiment uses the inhibited area according to the first embodiment, needless to say, the inhibited area according to the second embodiment may be used alternatively. Also, the fourth embodiment may be configured such that even when the location indicated by added location information falls within an inhibited area, the image can be distributed with the location information added if the recipient has not been registered.

Preferred embodiments of the present invention have been described in detail above. Nevertheless, the present invention is not limited to these specific embodiments and the invention can be achieved through various other embodiments without departing from the spirit and scope of the invention. Parts of the embodiments described above may be combined as appropriate. For example, it is apparent that exception handling of the third embodiment and exception handling of the fourth embodiment may be used at the same time.

This will be described more specifically. In the first to fourth embodiments, conditions A to C below are used to determine whether to delete location information.

A: The photographed site is within a registered range (first and second embodiments)

B: The photographic image contains the face of a specific person (third embodiment)

C: The destination of the photographic image is a registered address (fourth embodiment)

In the first and second embodiments, location information is deleted when condition A is true. In the third embodiment, location information is deleted when "condition A $\wedge$ condition B" is true ($\wedge$ represents logical AND). In the fourth embodiment, location information is deleted when "condition A $\wedge$ z,**22** condition C" is true ($\neg$ represents logical NOT).

To delete location information, conditions A to C can be used in any appropriate combination. For example, location information may be configured to be deleted when "condition A $\wedge$ condition B $\wedge$ $\neg$ condition C" is true (i.e., the photographed site is within a registered range, the photographic image contains the face of a specific person, and the destination of the photographic image is not a registered address). Processing procedures for that will be apparent to those skilled in the art from the flowcharts in FIGS. **11** and **14** described above. User interfaces used for that will also be apparent to those skilled in the art from the description of FIGS. **9**A and **12**A.

Also, location information may be configured to be deleted when "condition A $\wedge$ (condition B $\wedge$ $\neg$ condition C)" is true (i.e., the photographed site is within a registered range, and the photographic image contains the face of a specific person or the destination of the photographic image is not a registered address). Furthermore, location information may be configured to be deleted when "condition A $\wedge$ $\neg$ condition B" is true (i.e., the photographed site is within a registered range and the photographic image does not contain the face of a specific person) or location information may be configured to be deleted when "condition B $\wedge$ $\neg$ condition C" is true (i.e., the photographic image contains the face of a specific person and the destination of the photographic image is not a registered address).

Also, as the conditions for determining whether to delete location information, the user may be allowed to specify a desired combination of conditions A, B, and C described above. Specifically, the user may be allowed to create a logic operation of conditions A, B, and C and location information may be deleted when the result of the logic operation is true.

Aspects of the present invention can also be realized by a computer of a system or apparatus (or devices such as a CPU or MPU) that reads out and executes a program recorded on a memory device to perform the functions of the above-de-

scribed embodiment(s), and by a method, the steps of which are performed by a computer of a system or apparatus by, for example, reading out and executing a program recorded on a memory device to perform the functions of the above-described embodiment(s). For this purpose, the program is provided to the computer for example via a network or from a recording medium of various types serving as the memory device (e.g., computer-readable storage medium).

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application Nos. 2009-253524, filed Nov. 4, 2009 and 2010-214336, filed Sep. 24, 2010, which are hereby incorporated by reference herein in their entirety.

What is claimed is:

1. An image distribution apparatus which distributes image data to which location information has been added, comprising a processor coupled to a memory and programmed to provide:

a face checking unit configured to determine whether or not the image data includes a human face of a specific person; and

a distribution control unit configured to distribute the image data by deleting the location information from the image data to he distributed if said face checking unit determines that a human face of the specific person is included in the image data, and distribute the image data with the location information being added if said face checking unit determines that a human face of the specific person is not included in the image data.

2. The apparatus according to claim **1**, wherein the processor is further programmed to provide:

a storage unit configured to store information specifying an inhibited area concerning the location information;

an acquisition unit configured to acquire the location information added to the image data to be distributed; and

a location checking unit configured to determine whether or not a location indicated by the location information acquired by said acquisition unit falls within the inhibited area stored in said storage unit,

wherein said distribution control unit distributes the image data by deleting the location information from the image data to be distributed if said face checking unit determines that a human face of the specific person is included in the image data and said location checking unit determines that the location falls within the inhibited area.

3. The apparatus according to claim **1**, wherein the inhibited area is defined by information about a geographical location and information about a size of a range centered around the geographical location.

4. The apparatus according to claim **1**, wherein the processor is further programmed to provide

a memory storing a face image of the specific person,

wherein said face checking unit is configured to determine whether or not the image data includes a human face of a person identical to the specific person whose face image is stored in said memory.

5. The apparatus according to claim **1**, wherein the processor is further programmed to provide:

a recipient registration unit in which a recipient address is registered; and

an address checking unit configured to determine whether or not a recipient address of the image data to be distributed matches a recipient address registered in said recipient registration unit,

wherein, even if said face checking unit determines that a human face of the specific person is included in the image data, said distribution control unit distributes the image data with the location information being added if said address checking unit determines that the recipient address of the image data to be distributed matches the recipient address registered in said recipient registration unit.

6. A control method for an image distribution apparatus including a processor, which distributes image data to which location information has been added, the control method comprising:

a face checking step of determining, using the processor, whether or not the image data includes a human face of a specific person;

a distribution control step of distributing, using the processor, the image data by deleting the location information from the image data to be distributed if it is determined in said face checking step that a human face of the specific person is included in the image data, and distributing the image data with the location information being added if it is determined in said face checking step that a human face of the specific person is not included in the image data.

7. A non-transitory computer-readable storage medium storing a computer program for causing a computer of an image distribution apparatus, which distributes image data to which location information has been added, to execute:

a face checking step of determining whether or not the image data includes a human face of a specific person;

a distribution control step of distributing the image data by deleting the location information from the image data to be distributed if it is determined in said face checking step that a human face of the specific person is included in the image data, and distributing the image data with the location information being added if it is determined in said face checking step that a human face of the specific person is not included in the image data.

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